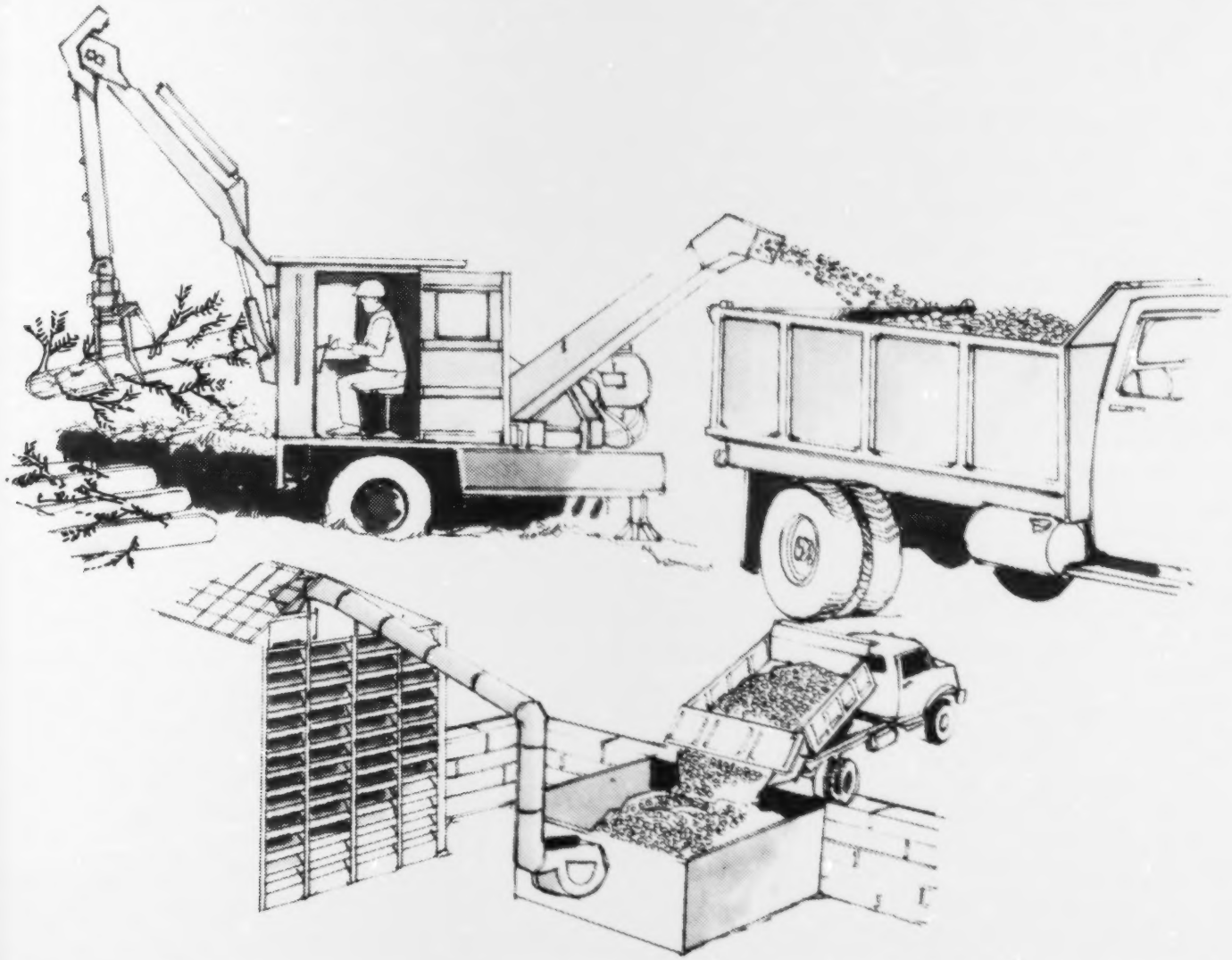
Canada-Newfoundland

CONSERVATION AND RENEWABLE ENERGY DEMONSTRATION AGREEMENT

# LARGE SCALE WOODHEATING



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# CANADA/NEWFOUNDLAND CONSERVATION AND RENEWABLE ENERGY DEMONSTRATION PROGRAM

In June 1979, to help meet the demand for energy conservation and to encourage the search for alternative sources of energy, the Government of Canada and the Government of Newfoundland and Labrador signed the Conservation and Renewable Energy Demonstration Agreement (CREDA).

This five year, $11,250,000 cost shared program (Federal 80% - Provincial 20%) ended March 31, 1985. Information obtained from project demonstrations is now available to the public.

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CONSERVATION AND RENEWABLE ENERGY DEMONSTRATION AGREEMENT

# LARGE SCALE WOOD HEATING

*Cutting a hardwood stand in Central Newfoundland.*

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Design and Layout: Ted Mills and Associates Limited
Printed by: Creative Printers and Publishers Limited
Published by: Energy Branch, Department of Mines and Energy
Government of Newfoundland and Labrador
ISBN NO: 0-920769-28-4
Date: August, 1986

# Introduction

Burning wood for energy is OK for the home but for larger premises, forget it! All that time waiting for wood to dry, the mess, the work, it just wouldn't be economic, would it?

Right?

Wrong! The prime source of energy for the James Paton Memorial Hospital in Gander is wood. The Newfoundland Hardwoods plant in Clarenville, which produces creosoted wood products and asphalt, and the Clarenville District Vocational School use wood too.

How do they do it? They use woodchips made from trees which are no good for lumber or pulpwood, and from sawmill waste. The chips are burned *green*, in special burners which provide the controllable output needed. And since chips are a bulk material, they are fed automatically, without the high labour content or undue mess.

Why do they do it? Reduced costs. Woodchips provide energy at half to two-thirds the cost of oil. These savings will pay for the new plant in three to eight years, depending on usage. After that, energy costs will be reduced by the corresponding proportion.

And since a large part of the cost of the chips is labour, they are creating employment in their regions. That doesn't hurt their "corporate image" either.

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## Woodchips — the Fuel Source

Woodchips can be made from a variety of sources. From the forest, "junk" softwood from poor or high-graded stands, fire- and insect-damaged trees, non-comercial species such as birch and aspen, and logging slash can all be used. Cut areas are left clean for reforestation, and unproductive land is turned into a resource for the future.

Most parts of the province, except the Avalon and Burin Peninsulas, have adequate stocks of this type of wood for fuel within economic trucking distance, usually about 40 kilometers. Overall, there is enough to supply half a million tonnes of chips on a renewable basis. At that level, up to three hundred people could be employed in the woodchip supply industry. None of this would adversely affect the pulp or sawmill industries, or residential woodcutting.

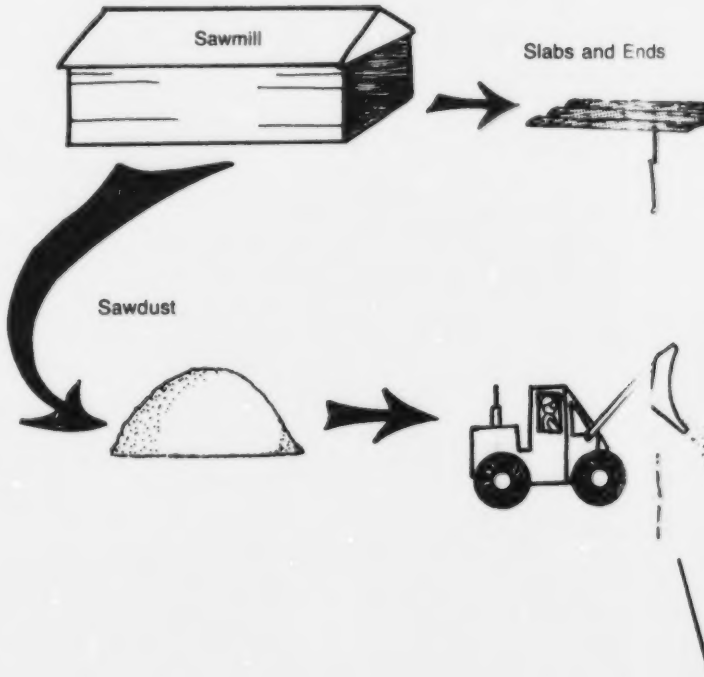
Sawmills are another source of fuel. Slabs and ends can be chipped, and sawdust mixed with chips. This is often cheaper than getting woodchips from the forest directly.

The woodchip supply contractor is usually responsible for keeping the storage at the customer's facility full. This is normally enough for 3-4 days at full output. The plant owner is responsible for operating and maintaining the boiler and chip feed systems.

Once a major facility in a region has converted to woodchips and established a supply industry, the conversion of smaller systems in the area becomes economic. In 1986, woodchips were being used in Gander and Clarenville. Corner Brook and Grand Falls are expected to have woodchip supply industries by late 1987, when the hospitals in those communities begin burning wood.

*Chipping junk softwood for fuel.*

## Woodchip Material Flow



Operating Woodchip Heating Systems in Newfoundland — 1986

| Plant | Size | Consumption (tonnes/yr) | Initial Cost | Annual Savings 1985 oil prices | Annual Savings 1986 oil prices |
|---|---|---|---|---|---|
| James Paton Mem. Hosp., Gander | 1.8 MW | 6,000 | $ 995,000[1] | $ 120,000 | $ 45,000 |
| Newfoundland Hardwoods, Clarenville | 3.0 MW | 6,000 | 615,000 | 200,000 | 70,000 |
| District Vocational School, Clarenville | 0.4 MW | 700 | 200,000 | 40,000 | 25,000 |
| Abitibi-Price Ltd. Grand Falls [2] | 13.0 MW | 48,000 | — | 1,600,000 | 570,000 |
| Corner Brook Pulp & Paper Co. Ltd.[2] | 6.0 MW | 15,000 | — | 500,000 | 180,000 |

Note 1: This was the first modern woodchip boiler system in the province, and cost considerably more than it would to install today.

Note 2: These are older bark-burning boilers. Their use is limited due to problems of ash emissions which the new designs do not have.

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## Woodchip Burning Systems

All commercial-scale woodchip burners use mechanical stokers. Feed systems vary, some designs using screw conveyors, while others employ belt systems. The heat output is fully and automatically controllable.

The smallest units of this type are rated at about 70 KW (250,000 BTU/hr). They cost about $250,000 installed. The largest units can cost over $1 million, but the savings achieved would still repay the investment quickly.

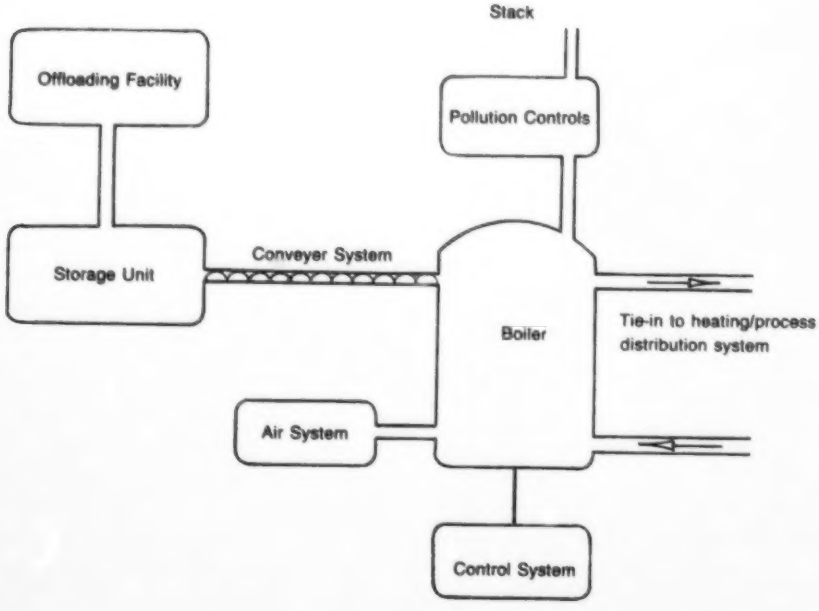
There are a number of ways of installing the woodchip burning equipment. Which is best for a particular facility depends on many factors. These need to be investigated as part of a thorough feasibility study.

Small woodchip burners can often be put in the existing space. Large facilities frequently need a new boiler house, but this should not make the project uneconomic.

*Woodchip system being installed at Newfoundland Hardwoods in Clarenville. 1. Unloading station. 2. Pneumatic conveyor to clear rail line. 3. Chip silo, with boiler house extension behind.*

For the Vocational School in Clarenville, the new system was built into standard containers. Onsite, this "packaged boiler" system was set up on prepared foundations and connected to the existing heating system. The installed cost of this was considerably lower than other alternatives.

# Typical Woodchip System



How Woodchips Compare as Fuel

| | Furnace Oil (#2) | Bunker Oil (#6) | Woodchips | Electricity |
|---|---|---|---|---|
| Higher heating value (kJ/kg) | 54,350 | 52,150 | 29,000 | — |
| (BTU/lb) | 23,370 | 22,425 | 8,600 | — |
| Moisture Content% (as burned) | 0.1 | 0.1 | 50 | — |
| Cost (1986 contract) | 23¢/L | 16¢/L | $33/tonne | 6.0¢/kWh[1] |
| Cost per kWh (including efficiency factor) | 2.7¢ | 1.6¢ | 1.5¢ | 6.0¢ |

Note 1. Includes average demand charges

## Other Applications of Woodfuel

There are other ways to put woodchips to work.

Where several smaller facilities are fairly close, *district heating* is a possibility. A central heating plant produces steam or hot water which is piped to the surrounding buildings. Larger single boiler systems are more economic to buy and install than a number of smaller units. Since the heat supplied to each building can be metered, they need not all be owned by one organization.

High-pressure steam produced by larger plants can be used to generate electricity and heat simultaneously. This is called *co-generation*. The cost of conversion is increased, but there are additional savings from electrical generation, especially when costly diesel-fuelled generation is replaced.

### *The Feasibility Study*

*Because of the various options, evaluating the feasibility of converting to woodchips is a job for the experienced engineer. Critical factors include the level and pattern of the energy demand, cost of installation (including downtime costs), the distance from the plant to the trees, availibility of sawmill residue (which can be mixed with the chips to reduce overall costs), and pollution controls which the Department of Environment requires. Modern woodchip-fuelled boilers allow virtually no harmful emissions into the air.*

*The study should tell you: what conversion to woodchip fuel would cost; what the operating and debt service costs would be; what the operational savings would be; and how long it would take to repay the investment at a range of oil price levels.*

*Each of these categories could contain a number of options. Finally, there should be a recommendation on whether conversion is justified, and if so, which is the best set of options.*

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## Technical and Financial Alternatives

Energy, Mines and Resources Canada, and the Energy Branch, Department of Mines and Energy have been closely involved in developing and promoting woodfuel use in Newfoundland and Labrador. If you are interested in investigating the benefits of switching, the addresses are on inside front cover.

## CANADA/NEWFOUNDLAND CREDA INFORMATION FOLDERS

- New Housing
- Housing Retrofit
- Commercial Building Retrofit
- Greenhouses
- Fish Plants and Vessels
- Swimming Pools
- Arenas
- Hospitals
- Schools
- Waste Heat Recovery
- Electrical Load Management
- Heat Pumps
- Large Scale Wood Heating
- Fuel Peat in Newfoundland
- Energy from Waste

For these folders, or more information on energy projects funded under the Canada/Newfoundland CREDA program, contact:


Information Section, Energy Branch
Department of Mines and Energy
P. O. Box 4750, St. John's, Nfld., A1C 5T7
(709) 576-2411

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St. John's, Nfld., A1C 6C9
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